

Research Note

Sarcocystis felis sp. n. (Protozoa: Sarcocystidae) from the Bobcat (*Felis rufus*)

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ABSTRACT: *Sarcocystis felis* sp. n. was found in striated muscles of 4 of 6 bobcats (*Felis rufus*) from Arkansas. Sarcocysts were up to 2.1 mm long and up to 150 μ m wide. The sarcocyst wall was about 1- μ m thick and contained hobnaillike bumps and elongated villi. Bradyzoites were about 10 \times 1.5 μ m. *Sarcocystis felis* was structurally similar to sarcocysts from panthers, cougars, and domestic cats.

KEY WORDS: bobcat, *Felis rufus*, sarcocysts, *Sarcocystis felis*, panthers, cougars, cats.

Sarcocystis spp. undergo a 2-host life cycle involving prey and predator animals. Infection of muscles by *Sarcocystis* spp. is common in herbivores but rare in carnivores (Dubey et al., 1989). Sarcocysts have been reported in muscles of domestic cats (*Felis domesticus*) (Kirkpatrick et al., 1986; Everitt et al., 1987; Edwards et al., 1988; Fiori and Lowndes, 1988; Hill et al., 1988) from the U.S., in a leopard (*Panthera pardus*) and a lion (Bhatavedkar and Purohit, 1963; Somvanishi et al., 1987) from India, in Florida panthers (*Felis concolor coryi*) and cougars (*Felis concolor stanleyana*) from Florida and Texas (Greiner et al., 1989), and from Florida bobcats (*Felis rufus floridanus*) (Anderson et al., 1992), and a cougar from the National Zoo in Washington, D.C. (Kluge, 1967). In the present paper we describe sarcocysts in muscles of bobcats (*Felis rufus*).

Specimens of heart, esophagus, tongue, diaphragm, and masseter muscles of 6 (4 males and 2 females) bobcats from southwestern Arkansas were fixed in 10% neutral buffered formalin. Paraffin-embedded sections were cut at 5 μ m thickness and examined after staining with hematoxylin and eosin. Formalin-fixed muscles from tongue were postfixed in osmium and processed

for transmission electron microscopy. Sarcocysts were found in 4 bobcats (heart and tongue of 1, tongues alone of 2, masseter muscles of 1 and esophagus of 1). All measurements are in micrometers unless stated otherwise.

Sarcocystis felis sp. n. (Figs. 1–4)

DIAGNOSIS: Sarcocysts from tongue up to 2.1 mm long and up to 150 wide; cyst wall 1.0–1.5 thick with 0.4–1.2 long fingerlike villar projections (Figs. 1–3). Parasitophorous vacuole membrane (PVM) of the primary cyst wall folded into short hobnaillike bumps and villar projections 0.6–1.2 long \times 0.3–0.4 wide at uneven distances, villi without microtubules, PVM including villi and hobnail bumps lined by 66-nm electron dense thick layer (Fig. 3). Ground substance 0.7–1.0 thick with amorphous material and few electron dense granules. Septa 0.1–0.2 thick, bradyzoites 7.0–10.0 \times 1.5 long \times 1.5–2.0 wide, micronemes in anterior (apical) third portion, nucleus terminal (Fig. 4).

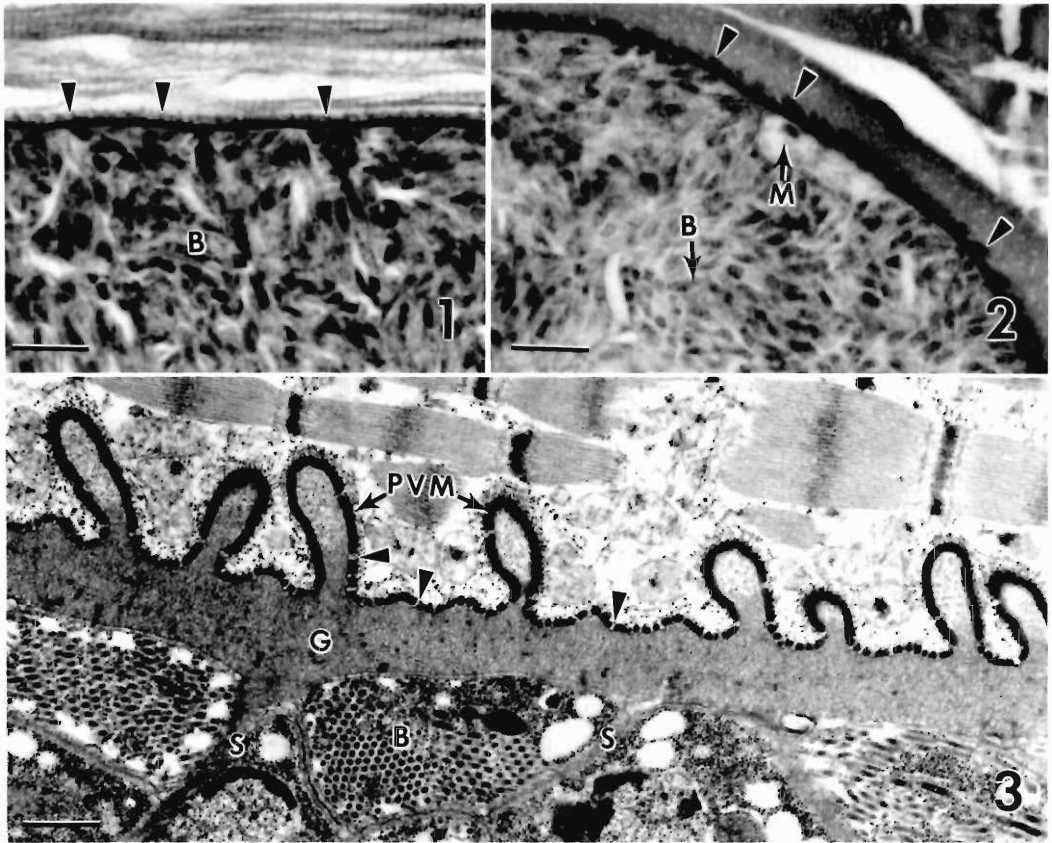
TYPE HOST: *Felis rufus* (bobcat). Other hosts: *Felis domesticus* (domestic cat), *Felis concolor coryi* (Florida panther), and *Felis concolor stanleyana* (cougar).

DISTRIBUTION: North America.

SYNTYPE: Section of tongue from the bobcat deposited in U.S. National Museum. USNM No. 82095.

Sarcocystis species are generally host specific. The structure of the sarcocyst wall is considered a reliable criterion for distinguishing *Sarcocystis* species within a given host (Dubey et al., 1989). Based on the structure of the sarcocyst wall, Du-

† Deceased.



Figures 1–3. *Sarcocystis felis* sp. n. sarcocysts in tongue muscles of naturally infected bobcat. 1, 2. Light microscope photomicrographs of sarcocysts in longitudinal (Fig. 1) and oblique (Fig. 2) sections. Arrowheads point to villar projections on the cyst wall. Pale staining metrocytes (M) and banana-shaped bradyzoites are enclosed in the cyst. Hematoxylin and eosin stain. Bar = 10 μ m. 3. Transmission electron micrograph of the cyst wall. Note differences in length of the villar projections and electron dense lining under the parasitophorous vacuole membrane (PVM). The electron dense lining is interrupted (arrowheads) both in the villar projections as well as in nonvillar portions. The ground substance (GS) lacks microtubules. Septa (S) arise from the GS. Bradyzoites (B) are juxtaposed under the GS. Bar = 0.66 μ m.

bey et al. (1989) grouped *Sarcocystis* species into 24 types. The ultrastructure of *S. felis* most closely resembles the type 9 sarcocysts occurring in rodents and voles (Dubey et al., 1989). However, in type 9 sarcocysts the villi have microtubules and villi taper at the free end.

The structure of sarcocysts from the bobcat resembles sarcocysts from domestic cats (Kirkpatrick et al., 1986; Everitt et al., 1987; Edwards et al., 1988; Fiori and Lowndes, 1988; Hill et al., 1988), panthers and cougars (Greiner et al., 1989), and Florida bobcats (Anderson et al., 1992). These *Sarcocystis* species from the Felidae have not been named because they were considered to be rare and their life cycles unknown. How-

ever, the present study and that of Greiner et al. (1989) and Anderson et al. (1992) indicate that sarcocysts in cats are not rare; collectively they have been found in 4 of 4 cougars, 11 of 14 panthers, and 4 of 6 bobcats (present study), and 30 of 60 Florida bobcats. Structurally, only 1 type of sarcocyst has been seen in bobcats, domestic cats, panthers, and cougars. Although the name *Sarcocystis felis* is proposed for the species in bobcats, the same species probably occurs in other Felidae. Nothing is known of the life cycle of these sarcocysts in Felidae; however, it most likely involves a predator or scavenger feeding on these cats (Greiner et al., 1989).

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Figure 4. Transmission electron micrograph of bradyzoites of *Sarcocystis felis* sp. n. One bradyzoite (arrows) is cut longitudinally. Note an anteriorly located conoid (C), numerous micronemes (MI), few rhoptries (R), single mitochondrion (MT), and a posteriorly located nucleus (N). Bar = 0.76 μ m.

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